

CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA 4

GATES AND GRELLIN LABORATORIES OF CHEMISTRY

4 January 1956

Professor Joshua Lederberg
Department of Genetics
The University of Wisconsin
Madison 6, Wisconsin

Dear Professor Lederberg:

I am surprised to notice that your letter arrived here nearly two months ago. I have not had any special reason for postponing my answer - just the usual one of having been busy with various jobs.

I have often pointed out, as you mention, that a crystal of a molecular substance can be considered as showing complementariness - each molecule is complementary in structure to the aggregate of the surrounding molecules. In the process of crystallization the molecules select the structure (the way of packing) that gives the greatest complementariness, and hence the greatest stabilization through intermolecular attraction.

One might ask, as you do, whether two different kinds of molecules, A and B, might not be able to pack together, in a crystal, better than the individual molecules can pack by themselves in the crystals of the separate pure substances. The answer is that this might happen sometimes and not other times. For example, when a racemic mixture of two optical isomers is allowed to crystallize, one obtains racemic crystals roughly half the time, and right-handed and left-handed crystals the other half of the time. In the same way, when salts are crystallized together, such as potassium chloride and magnesium chloride, one may obtain crystals of a double salt, or one may obtain two kinds of crystals, of the individual salts, *depending on the salts.*

*that is,
for many
the substances*

I have not so far made any reference to mixed crystals (solid solutions). I think that one can understand why mixed crystals in general form only between substances with very nearly the same molecular size and shape. A crystal of substance A, for example, has, when one molecule A is removed from inside it, a cavity into which this molecule fits neatly; in general a mole-

Dr. Lederberg

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cule B would not fit into this cavity, and hence in general A and B would not form solid solutions.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Linus Pauling". The signature is written in a cursive style with a large, prominent "P" at the beginning.

Linus Pauling:W